

## LA-UR-21-28268

Approved for public release; distribution is unlimited.

Title: bolt: A Fast Solver for Kinetic Theories Using a High-Resolution  
Constrained Transport Scheme

Author(s): Ryan, Benjamin Ransom  
Morampudi, Manichandra

Intended for: Institutional Computing report presentation

Issued: 2021-08-18

---

**Disclaimer:**

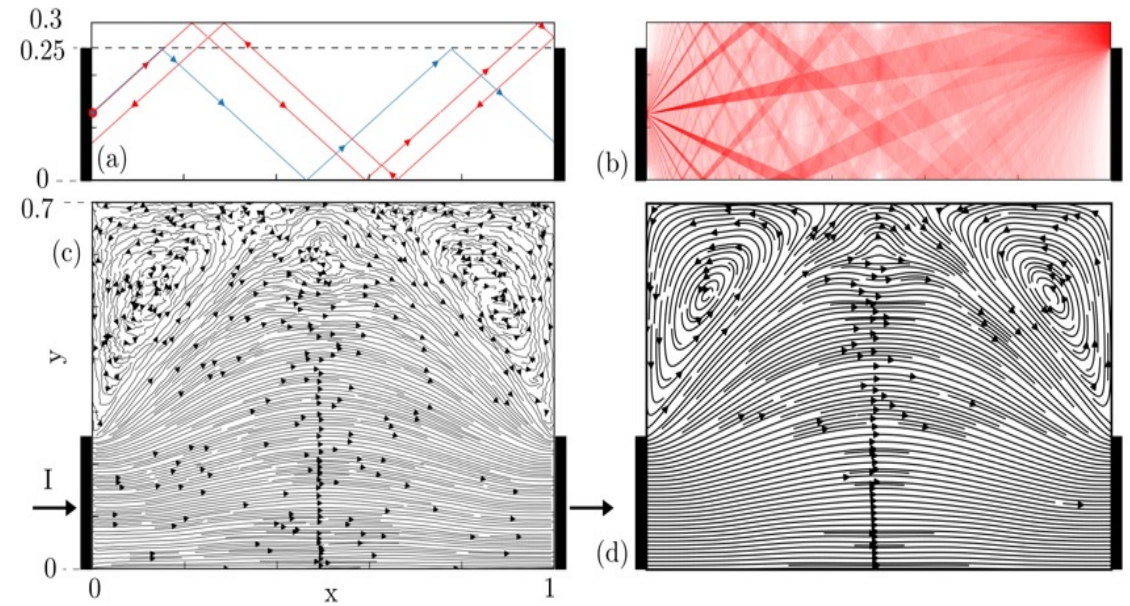
Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by Triad National Security, LLC for the National Nuclear Security Administration of U.S. Department of Energy under contract 89233218CNA000001. By approving this article, the publisher recognizes that the U.S. Government retains nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.

# **bolt: A Fast Solver for Kinetic Theories Using a High-Resolution Constrained Transport Scheme**

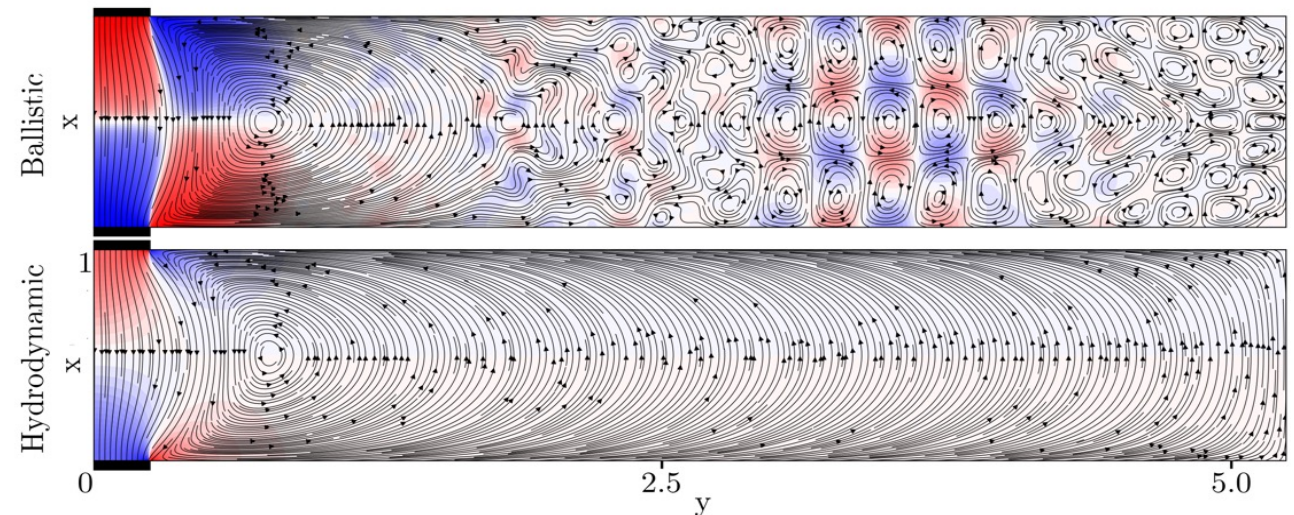
Our understanding of collisionless and semi-collisional plasmas in the nonlinear regime is limited by the expense of computing solutions numerically. Bolt is a fast, GPU-accelerated code for rapidly computing such solutions with accurate transport and an approximate collision operator.

Such calculations are relevant to both problems in astrophysics, such as heat conduction and magnetic reconnection in accretion disks around black holes, and also to programmatic interests at LANL.

The bolt code paper, demonstrating accuracy via a suite of test problems calculated on kodiak, is currently in preparation .



Stochastic methods for collisionless transport (e.g. left) lose symmetries in problems that are preserved by deterministic methods like bolt (right).



Collisionless flows of electrons through channels show vortical structures distinct from purely hydrodynamic flows.